ABSTRACT

Data science education is important for all students because they need data science literacy to succeed in their future careers and to be able to make informed decisions as citizens. In this curricular study, I redesigned two data science labs so that they were centered around social justice issues and included scaffolds and artifacts that encourage communication in many forms. The redesigned labs contained coding questions, individual written reflection questions, and group discussion questions. Using the theory of distributed cognition, I designed the scaffolds and artifacts in the labs to help students engage in multimodal communication. In other words, students discussed the data science work that they did and the implications of this work in writing and through talking.

This study was done using design-based research (DBR) to allow for multiple iterations to improve the scaffolds and artifacts in the labs. Through the DBR process, I was able to document the principles of distributed cognition that I used to design the labs, as well as the changes that I made to the labs and the reasons behind making those changes. Through using the Toulmin Argumentation Pattern to analyze the group discussion questions and Thematic Analysis to analyze the individual reflection questions, I found evidence that the students engaged in computational action (CA) and social justice awareness. In their group discussions, most groups used the data analysis that they did as the grounds or warrants for their arguments. In other words, they used the data science that they did to justify their claims and the scaffolds provided data for these claims. The students also engaged in data science practices by acting as real data scientists while working on authentic problems related to social justice issues.

In their individual reflections, the students reflected on their analysis, the implications of this analysis, and were able to connect the work they did inside the classroom to the world

outside of the classroom. I found themes related to social justice, data science concepts, and the connection to the outside world which showed evidence that the students engaged in computational action and social justice awareness. This work provides examples of two labs that are curricular innovations with social justice components in a data science course. I also identified five design principles for creating labs that focus on multimodal communication and social justice. This study also illustrates methods that can aid in the understanding of how to improve data science labs.